IN THE CLAIMS

Please amend the claims to read as follows:

Listing of Claims

1. (Currently Amended) A multicarrier transmitter for performing data transmission by way of digital multicarrier modulation using a real coefficient wavelet filter bank, said multicarrier transmitter comprises comprising:

a signal point mapping unit for performing symbol mapping of a series of information;

a serial-to-parallel converter for converting serial data as said symbol mapped series of information to parallel data;

a first inverse wavelet transformer including a first plurality of real coefficient wavelet filters orthogonal to each other, said first inverse wavelet transformer performing a first inverse wavelet transform on said parallel data and to output an in-phase signal of said complex data;

a second inverse wavelet transformer including [[:]] a second plurality of real coefficient wavelet filters [[of]] that implement a Hilbert transform relative to the first plurality of real coefficient wavelet filters of said first inverse wavelet transformer where Hilbert transform has been made, said second inverse wavelet transformer performing a second inverse wavelet transform on said parallel data and outputting an orthogonal signal of said complex data; and

a modulator for performing single-sideband (SSB) modulation by using [[an]] said in-phase signal of complex information from said first inverse wavelet transformer [[an]] and said orthogonal signal of complex information from the second inverse wavelet transformer, wherein:

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said first inverse wavelet transformer includes a discrete cosine transformer for inputting the parallel data from said serial-to-parallel converter ~~and for outputting the in-phase signal of complex information;~~ and

said first plurality of real coefficient wavelet filters includes a first prototype filter including a polyphase filter, said first prototype filter receiving output data of said discrete cosine transformer and outputting said in-phase signal of complex information, and

wherein:

said second inverse wavelet transformer includes a discrete sine transformer for inputting the parallel data from said serial-to-parallel converter ~~and for outputting the orthogonal signal of complex information;~~ and

said second plurality of real coefficient wavelet filters includes a second prototype filter including a polyphase filter, said second prototype filter receiving output data of said discrete sine transformer and outputting said orthogonal signal of complex information.

2. (Currently Amended) The multicarrier transmitter according to claim 1, wherein said ~~first inverse wavelet transformer comprises: a~~ first prototype filter further ~~including~~ includes: ~~a polyphase filter having a real coefficient, said first prototype filter inputting output data of said discrete cosine transformer;~~

M upsamplers for inputting output data of said first prototype filter; and

M-1 single sample delay elements for inputting output data of said upsamplers.

3. (Currently Amended) The multicarrier transmitter according to claim 1, wherein said ~~second inverse wavelet transformer comprises: a~~ second prototype filter <u>further</u> ~~including~~ ~~including~~ <u>includes:</u> ~~a polyphase filter having a real coefficient, said second prototype filter inputting output data of said discrete sine transformer;~~

M upsamplers for inputting output data of said second prototype filter; and

M-1 single sample delay elements for inputting output data of said upsamplers.

4. (Currently Amended) The multicarrier transmitter according to claim 1, ~~wherein said~~ ~~first inverse wavelet transformer comprises:~~ <u>wherein:</u> [[a]]

<u>said</u> first prototype filter ~~including~~ <u>includes:</u> ~~a polyphase filter having a real coefficient,~~ ~~said first prototype filter inputting output data of said discrete cosine transformer;~~

M upsamplers for inputting output data of said first prototype filter; and

M-1 single sample delay elements for inputting output data of said upsamplers; and

~~said second inverse wavelet transformer comprises:~~

[[a]] <u>said</u> second prototype filter ~~including~~ <u>includes:</u> ~~a polyphase filter having a real~~ ~~coefficient, said second prototype filter inputting output data of said discrete sine transformer;~~

M upsamplers for inputting output data of said second prototype filter; and

M-1 single sample delay elements for inputting output data of said upsamplers.

5-10. (Canceled)

11. (Currently Amended) Multicarrier communications apparatus ~~comprising a multicarrier transmitter and a multicarrier receiver, said multicarrier communications apparatus~~ performing data transmission by way of digital multicarrier modulation/demodulation using a real coefficient wavelet filter bank including M real coefficient wavelet filters (M being a positive integer), said multicarrier communications apparatus comprising:

a multicarrier transmitter and a multicarrier receiver,

said ~~multicarrier communications~~ transmitter comprising:

a signal point mapping unit for converting bit data to symbol data to map said symbol data on M/2 complex coordinate planes;

a serial-to-parallel converter for converting serial data as said mapped symbol data to parallel data;

a complex data decomposer for inputting said parallel data as well as decomposing complex data into a real part and an imaginary part ~~so as to supply an in-phase component of complex information to the (2n-1)th input to said first and said second inverse wavelet transformers and supply an orthogonal component to the 2nth input (where $1 \leq n \leq (M/2-1)$, a subcarrier number is 0 to M-1)~~;

a first inverse wavelet transformer comprising said M real coefficient wavelet filters orthogonal to each other, said first inverse wavelet transformer outputting an in-phase signal of said complex data;

a second inverse wavelet transformer comprising said M real coefficient wavelet filters orthogonal to each other, said second inverse wavelet transformer outputting an orthogonal signal of said complex data;

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wherein said complex data decomposer supplies an in-phase component of complex information to the (2n-1)th input to said first and said second inverse wavelet transformers and supplies an orthogonal component of the complex information to the 2nth input (where 1≤n≤(M/2-1), a subcarrier number is 0 to M-1); and

a single-sideband (SSB) modulator for performing SSB modulation by using [[an]] the in-phase signal of said complex information data from said first inverse wavelet transformer and [[an]] the orthogonal signal of said complex information data from said second inverse wavelet transformer;

wherein said first inverse wavelet transformer includes:

a discrete cosine transformer for inputting the parallel data from said complex data generator and for outputting the in-phase signal of complex information decomposer; and

said M real coefficient wavelet filters of said first inverse wavelet transformer comprise a first prototype filter including a polyphase filter, said first prototype filter receiving output data of said discrete cosine transformer and outputting the in-phase signal of complex information, and

wherein said second inverse wavelet transformer includes:

a discrete sine transformer for inputting the parallel data from said complex data generator and for outputting the orthogonal signal of complex information decomposer; and

said M real coefficient wavelet filters of said second inverse wavelet transformer comprise a second prototype filter including a polyphase filter, said second prototype filter receiving output data of said discrete sine transformer and outputting the orthogonal signal of complex information, and

wherein a said detector of said multicarrier receiver includes a detector that comprises:

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a multiplier for downconverting a received bandpass signal as a receive signal of a received bandpass signal to a baseband signal;

a local oscillator for providing said multiplier with a signal of a predetermined frequency;

[[an]] a low pass filter (LPF) for removing an unwanted signal outside the band of [[a]] the baseband signal output from said multiplier;

a first wavelet transformer comprising M real coefficient wavelet filters orthogonal to each other, said first wavelet transformer inputting the output data from said LPF; and

a complex data generator for generating complex data by using the (2n-1)th output from said first wavelet transformer as an in-phase component of complex information and the 2nth output from said first wavelet transformer as an orthogonal component (where $1 \leq n \leq (M/2-1)$, and a subcarrier number is 0 to M-1).

12. (Previously Amended) Multicarrier communications apparatus ~~comprising a multicarrier transmitter and a multicarrier receiver, said multicarrier communications apparatus~~ performing data transmission by way of digital multicarrier modulation/demodulation using a real coefficient wavelet filter bank including M real coefficient wavelet filters (M being a positive integer), said communications apparatus comprising:

a multicarrier transmitter and a multicarrier receiver,

said multicarrier ~~communications~~ transmitter comprising:

a synchronization data generator for generating a signal as data known to said multicarrier receiver and the multicarrier transmitter according to claim 11 as a modulator for inputting said signal as known data from said synchronization data generator; and

~~said multicarrier receiver comprising:~~

<u>wherein</u> the detector ~~according to claim 11 for outputting~~ <u>outputs</u> adjacent complex subcarrier data including a subcarrier pair and <u>includes</u> a synchronization estimation circuit for estimating a symbol synchronization timing from the difference between [[said]] adjacent complex subcarrier data items.

13. (Canceled)

14. (Currently Amended) A multicarrier transmitter for performing data transmission by way of digital multicarrier modulation using a real coefficient wavelet filter bank, said multicarrier transmitter comprising:

a signal point mapping unit for performing symbol mapping of a series of information;

a serial-to-parallel converter for converting serial data as said symbol mapped series of information to parallel data;

a first inverse wavelet transformer for performing a first inverse wavelet transform on said parallel data, said first inverse wavelet transformer including a <u>first</u> plurality of real coefficient wavelet filters;

a second inverse wavelet transformer for performing a second inverse wavelet transform on said parallel data, said second inverse wavelet transformer including a <u>second</u> plurality of real coefficient wavelet filters; and

a modulator for performing modulation by using an in-phase signal of complex information from said first inverse wavelet transformer and an orthogonal signal of complex information from said second inverse transformer,

wherein said first inverse wavelet transformer includes:

a discrete cosine transformer for inputting the parallel data from said serial-to-parallel converter ~~and for outputting the in-phase signal of complex information~~; and

said first plurality of real coefficient wavelet filters including a first prototype filter including a polyphase filter, said first prototype filter inputting output data of said discrete cosine transformer and outputting said in-phase signal of complex information, and

wherein said second inverse wavelet transformer includes:

a discrete sine transformer for inputting the parallel data from said serial-to-parallel converter ~~and for outputting the orthogonal signal of complex information~~; and

said second plurality of real coefficient wavelet filters including a second prototype filter including a polyphase filter, said second prototype filter inputting output data of said discrete sine transformer and outputting said orthogonal signal of complex information.

15. (Canceled).

16. (Currently Amended) A multicarrier communications apparatus comprising the multicarrier transmitter according to claim 14 and a multicarrier receiver for performing data reception by way of digital multicarrier demodulation using a real coefficient wavelet filter bank, said multicarrier receiver comprising:

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a multiplier for downconverting a received bandpass signal to a baseband signal;

a local oscillator for providing said multiplier with a signal of a predetermined frequency;

[[an]] a low pass filter (LPF) for removing an unwanted signal outside the band of baseband signal output from said multiplier;

a first wavelet transformer for performing a first wavelet transform on an output signal from said LPF, said first wavelet transformer including a first plurality of real coefficient wavelet filters;

a second wavelet transformer for performing a second wavelet transform on the output signal from said LPF, said second wavelet transformer including a second plurality of real coefficient wavelet filters;

an equalizer for equalizing each parallel signal of an in-phase signal output from said first wavelet transformer and an orthogonal signal output from said second wavelet transformer as a complex signal of each subcarrier;

a parallel-to-serial converter for converting an equalized parallel signal output from said equalizer to serial data; and

a determination unit for determining serial data output from said parallel-to-serial converter, wherein:

said multicarrier communications apparatus performs data transmission by way of digital multicarrier modulation/demodulation using a real coefficient wavelet filter bank.